

# Sixty-Third Annual Report of the Visitors of the University Observatory for 1937.

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Physical &  
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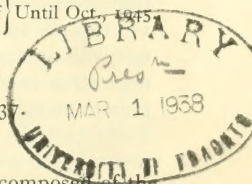
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G. M. B. DOBSON, M.A., D.Sc., F.R.S., Fellow of  
Merton.

Until Oct., 1940.  
Until Oct., 1945.

This report refers to the calendar year 1937.



### I. Staff.

The scientific staff of the Observatory is composed of the  
director, and the following—

*Chief Assistants:* T. L. Page, Magdalen (*Astronomy*); J. S.  
Hughes, New College (*Seismology*).

*Radcliffe Travelling Fellow in Astronomy:* H. Zanstra.

*Research Assistant:* Miss M. G. Adam, St. Hugh's College.

*Seismological Assistant:* Miss E. F. Bellamy.

### II. Instruction.

Lectures were given by the director on Solar Physics to  
four students in the Hilary Term, and on Stellar Astronomy  
to two students in the Michaelmas Term. T. L. Page

(Magdalen) and Miss Adam (St. Hugh's) continued their work for the degree of D.Phil., and D. K. Bailey (Queen's) commenced work for the degree of B.Sc. With the collaboration of Professor Milne a colloquium in Astrophysics was held weekly during the three terms. As in previous years, the Observatory was open on fine Saturday evenings in the Hilary and Michaelmas Terms; some 50 persons have taken advantage of this opportunity to see through the 12-inch telescope.

### III. Equipment

As reported last year, Hartmann tests of the solar telescope with the five mirrors in train revealed small zonal aberration, but astigmatism with a path difference of as much as  $\lambda/2$ . After correspondence with the makers and a further confirmatory Hartmann test on Arcturus, the three flats were returned for examination by Grubb, Parsons. They found the two 16-inch flats to be satisfactory, but their knife-edge test with an auxiliary spherical mirror revealed a cylindrical depression in the 5-inch Coudé flat. As this had not been present on the completion of their figuring there seemed little doubt that the fused silica disk had changed shape in the interval. After some experiments with this disk the Thermal Syndicate Co. replaced it with a new clear fused quartz disk. This latter was figured during the summer by Grubb, Parsons to an accuracy of  $\lambda/10$ , as revealed by a subsequent test with a Hilger Interferometer.

After silvering, the three flats were re-installed in the telescope in September, and after some trial solar exposures two new series of Hartmann tests were made. Somewhat surprisingly these revealed the persistence of astigmatism in objectionably large amount (path difference of one wave length). From the tests by the makers this is presumably not in the flats, and from successive Hartmann tests, with the 12-inch paraboloid rotated, clearly not in the latter. This leaves the convex Cassegrain as the most likely source, and

as it and the original Coudé were a pair it is not improbable that both have warped out of shape. The Cassegrain is being returned to the makers for examination.

Due to delay in the delivery of the mechanical parts and to a necessary change in the design of the control system, the assembly and adjustment of the solar spectroscope has not as yet been completed. Work, however, is now going forward well, and the instrument should be ready for use in the spring.

#### IV. Work.

*Astrophysics.* Apart from work in connexion with the solar telescope and spectroscope, the director has continued his investigation of the surface brightness of the sun in the continuous spectrum as a function of wave length and position on the disk. Transmission determinations of the filters and of the neutral tint wedge have taken an unexpectedly long time, and are still in progress. It will be at least 18 months before the first results are ready for publication. In addition to this programme, a method has been developed for the numerical integration of the equation of transfer for absorption lines. From the observed change of line profile across the solar disk the method yields the variation of Eddington's  $\epsilon$  (closely related to the electron pressure) and  $\eta$  as functions of optical depth. The method is laborious but exact, and is being given a preliminary trial on the observed profiles of the Mg b lines.

In the course of her study of the solar Swan bands at  $\lambda$  5160, Miss Adam has found that faint atomic lines share with faint molecular lines the property of increased equivalent width toward the limb. She has compared this hitherto unsuspected behaviour of faint lines with the predictions of the various theories of line formation, and has concluded, in a paper recently communicated to the Royal Astronomical Society, that this behaviour arises from reduced re-emission in these faint lines, due in the atoms to interlocking and in the molecules to large collisional area.

Mr. Page has continued his work on testing the validity of the astronomically important Kramers-Gaunt absorption law. Arc spectra under various pressures of the alkalis and alkaline earths having proved unsuitable as recombination spectra on account of superposed bands, the electrodeless discharge in hydrogen has been studied. By a careful adjustment of discharge conditions he has succeeded in extending the Balmer series down to the 21st member, and has obtained both the Balmer and Paschen continuous spectra with apparently almost complete freedom from the secondary spectrum of hydrogen. On account of the intermittency of the source, calibration and standardization of the plates has to be carried out under as nearly as possible identical conditions, but in spite of these difficulties a number of fully standardized plates in both the violet and the infra red were obtained. These are now in course of measurement and reduction.

A small quartz objective prism camera, the optical parts for which were loaned by the Royal Society at the suggestion of Dr. Dobson, has been designed by Mr. Page and Mr. Bailey. It is mounted in the breech end of the Astrographic Telescope, and is to be used for determining 'Zanstra temperatures' of the exciting stars of the bright diffuse nebulae. The initial adjustments have been completed, and some calibrated spectra of the Orion Nebula have been obtained.

Dr. Zanstra, whose appointment as Radcliffe Travelling Fellow in Astronomy dated from October, commenced work in April. He is making a theoretical investigation of the difficult problems of line formation and mechanical equilibrium in the solar chromosphere, and has already obtained some interesting results.

*Astrographic Catalogue.* Work on the two Potsdam zones of the Astrographic Catalogue has continued under the direction of Mr. H. Scott Barrett, whose part-time services are due to the generosity of the Radcliffe Trustees and the Astronomer Royal. During the year 24 plates have been measured by Mr. Cook and Mr. Burnet, the latter engaged



in this work through the generosity of Dr. Wilfred Hall. Zone  $+32^{\circ}$  is thus now completely measured, while only 16 plates, all occurring after R.A. 17 hours, have still to be measured to complete zone  $+33^{\circ}$ . The preparation of copy for the press has been continued, and is complete for zone  $+32^{\circ}$ , except for two plates awaiting final revision, and for zone  $+33^{\circ}$  as far as R.A. 17 hours. The re-computation of the plate constants is well in hand, and has been carried as far as 15 hours in both zones. It is anticipated that the work on the two zones will be completed early in 1939.

*Seismological Summary.* In spite of additional work in connexion with issuing a list of constants for seismological stations, and in investigating the effects of corrections arising from the ellipticity of the earth, the preparation of the *Summary* has gone steadily forward. The last three quarters of the year 1932 have been prepared, and work on the first quarter for 1933 is now in progress. The increased revenue from the International Seismological Association, noted in last year's report, has continued, but this has been to some extent offset by increased printing costs, and by allotting more of Mr. Cook's time to seismology and less to the Astrographic Catalogue.

## V. Publications.

The following papers have been published during the year as a result of work done at the Observatory:

- M. G. Adam. 'Variation of Faint Fraunhofer Lines across the Solar Disk', *Monthly Notices*, R.A.S., vol. 98, Dec.
- J. D. Babbitt. 'The Spectrum of  $\alpha$  Lyrae', *Canadian Journal of Research*, A vol. 15, p. 161.
- J. S. Hughes and E. F. Bellamy. *The International Seismological Summary*, Part 4, 1931. Parts 1 and 2, 1932. (County Press.)
- J. S. Hughes and E. F. Bellamy. *The Constants of Seismological Observatories*. (County Press.)

The first of these papers will appear in its reprint form as

Communications from the University Observatory No. 11.  
To this series Professor Milne has contributed No. 9, 'Stellar  
Luminosity and Photospheric Pressure', and No. 10, 'Stellar  
Luminosity and the Opacity in the Outer Layers of a Star'.

H. H. PLASKETT.

UNIVERSITY OBSERVATORY,  
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